Paper writing

1) Resubmission: a Joint Analysis of GM Vol, Perfusion, and WM dti in AD and FTD

2) Working: DTI captures WM degeneration of FTLD subtypes

3) Working: a longitudinal study of Amyotrophic lateral sclerosis (ALS)

(1) Joint Assessment of Structural, Perfusion, and Diffusion MRI in Alzheimer's Disease and Frontotemporal Dementia

➢ A new approach is introduced to analyze multimodal MRI data jointly

➢ FTD exhibits greater WM degeneration than AD at mild disease severity.

➢ Differences in WM degeneration between FTD and AD disappear with increasing disease Severity
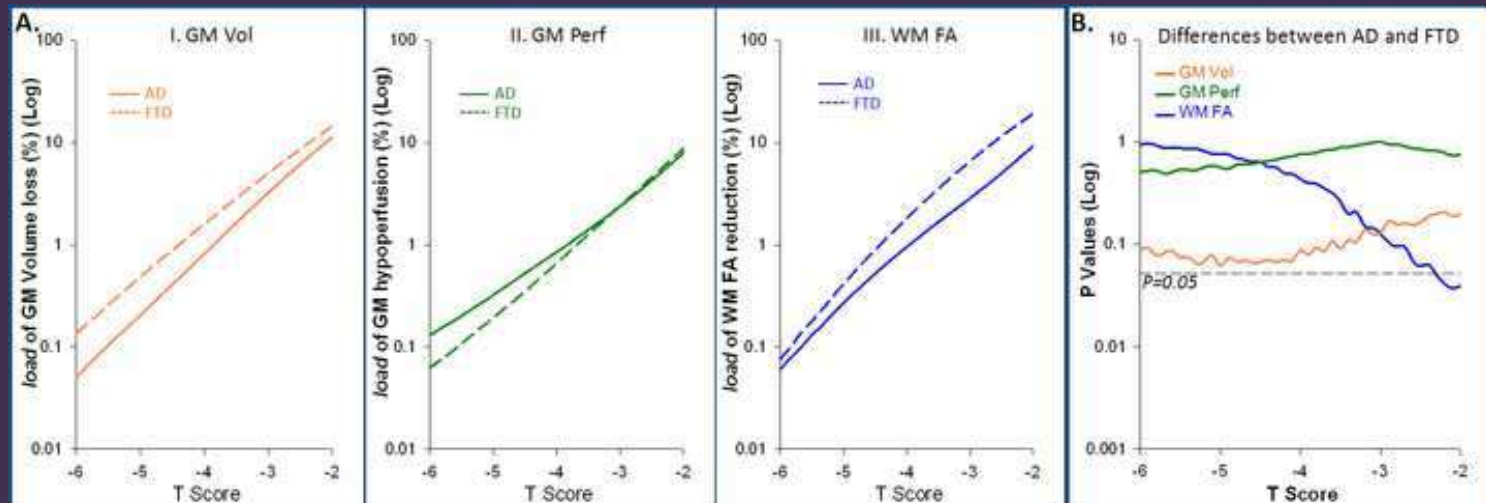
(1) Joint Assessment of Structural, Perfusion, and Diffusion MRI in Alzheimer's Disease and Frontotemporal Dementia

➢ In FTD, GM loss and WM degeneration exceed the amounts of GM hypoperfusion.

➢ In AD, the amounts of GM volume loss, hypoperfusion and WM degeneration are similar.
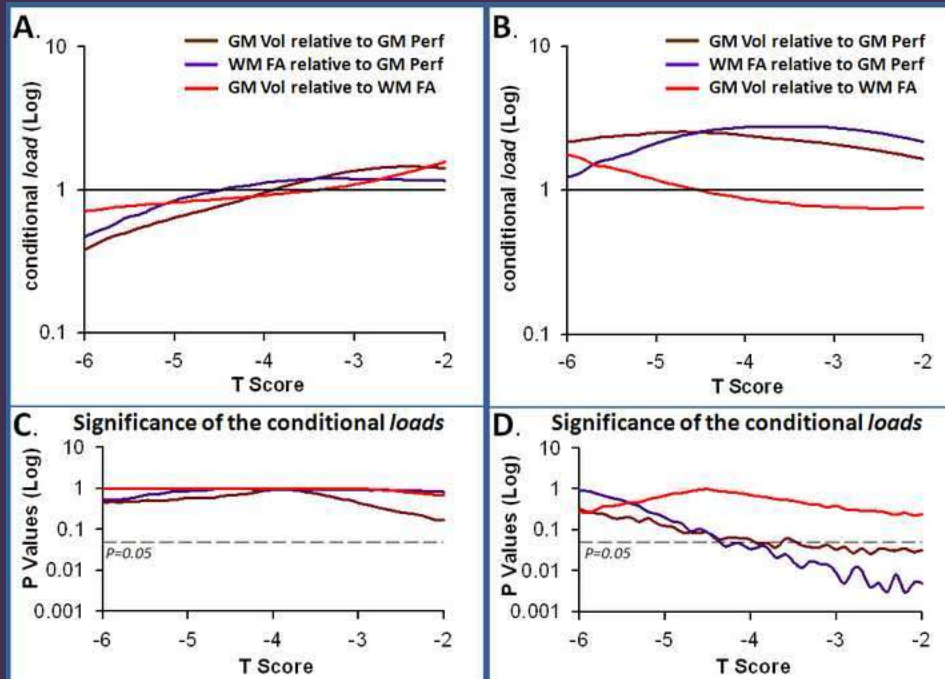
(2) Diffusion MRI characterizes white matter degradation in frontotemporal lobar degeneration subtypes

➢ to test if DTI reveals specific patterns of regional white matter degeneration in each FTLD subtype that mirrors the gray matter volume loss.

➢ to determine the extent to which radial diffusivity dominates the pattern of regional white matter abnormalities in the various FTLD subtypes using a multivariate analysis (Hotelling's T^2 test) for eigenvalues.

(2) Diffusion MRI characterizes white matter degradation in frontotemporal lobar degeneration subtypes
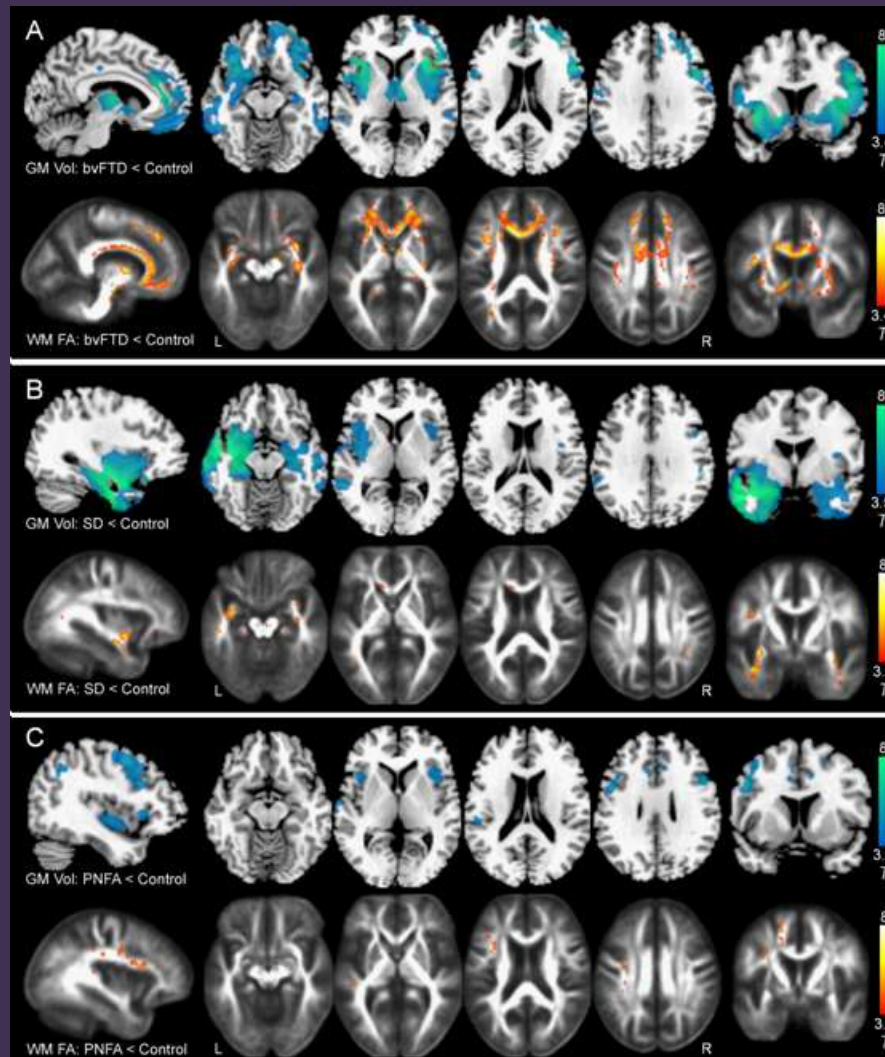
← Consistent with others, WM damage in regions related to behavior, emotion, as well as language function

← left-predominant WM damage, particular the left uncinate / parahippocamal tracts, associated with semantic network

← left arcuate fasciculus, a fiber circuit implicating language fluency

Similar findings has been reported by Whitwell JL, et al., 2010

(2) Diffusion MRI characterizes white matter degradation in frontotemporal lobar degeneration subtypes

➤ Univariate (FA only) and Multivariate (Hotellings T^2) for specific tracts in pair-wise group comparison

Region	Side	bvFTD < CN		SD < CN		PNFA < CN	
		FA	Hotellings T^2	FA	Hotellings T^2	FA	Hotellings T^2
a.CC		<0.001	<0.001	0.04	0.01	-	-
p.CC		0.02	0.001	-	0.02	-	-
a.Cg	Left	0.001	0.002	-	-	-	-
	Right	-	-	-	-	-	-
p.Cg	Left	-	-	-	-	-	-
	Right	-	-	-	-	-	-
pHP	Left	-	-	0.02	0.002	-	-
	Right	-	-	0.04	0.02	-	-
Unc	Left	0.002	0.001	<0.001	<0.001	-	0.04
	Right	0.001	<0.001	0.004	<0.001	-	-
Arc	Left	-	-	-	-	0.02	-
	Right	-	-	-	-	-	-
Fornix		<0.001	<0.001	<0.001	0.002	-	0.03

Significance threshold: P<0.05

(2) Diffusion MRI characterizes white matter degradation in frontotemporal lobar degeneration subtypes
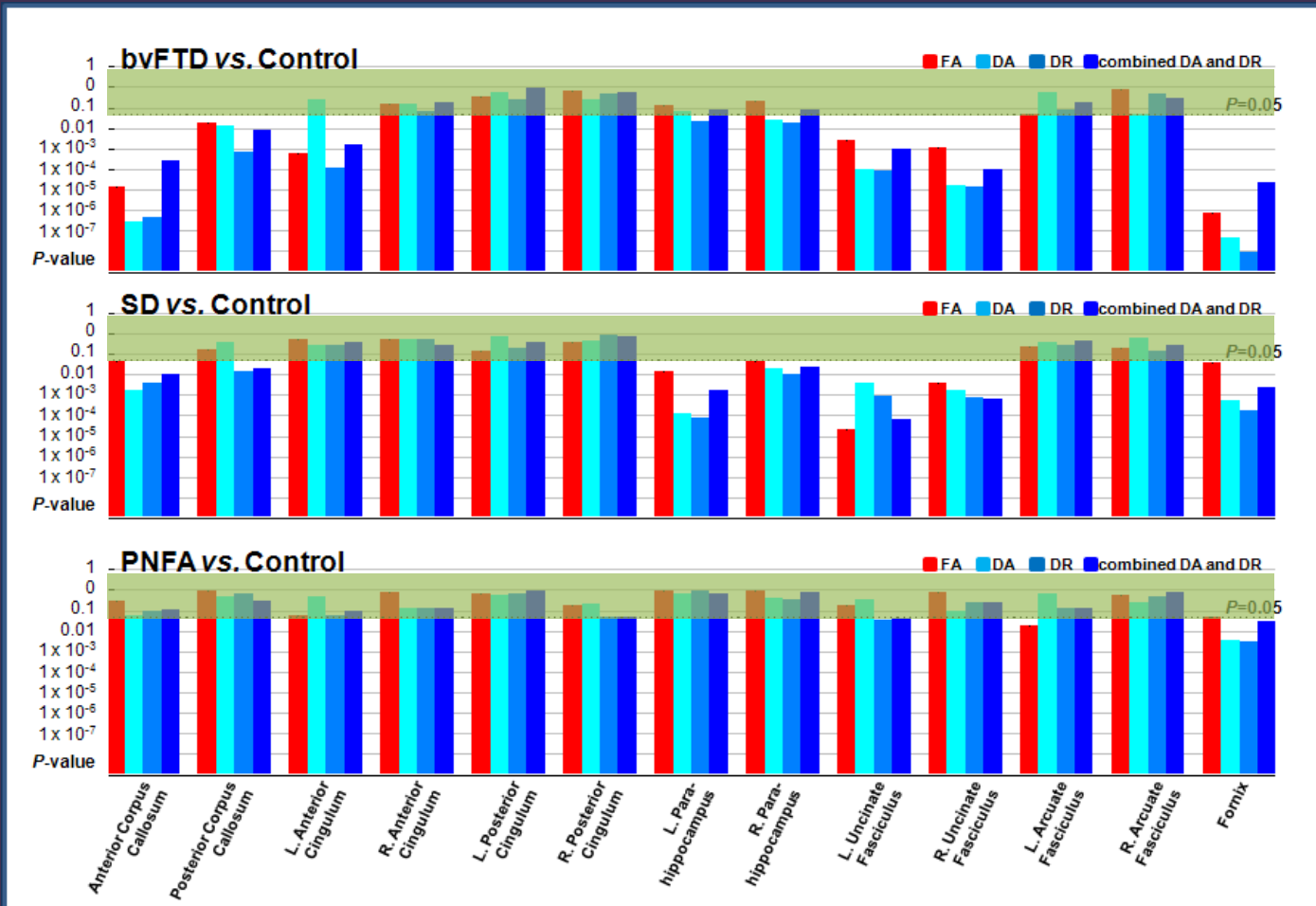
- multivariate analysis shows a similar pattern of WM abnormalities as FA did.
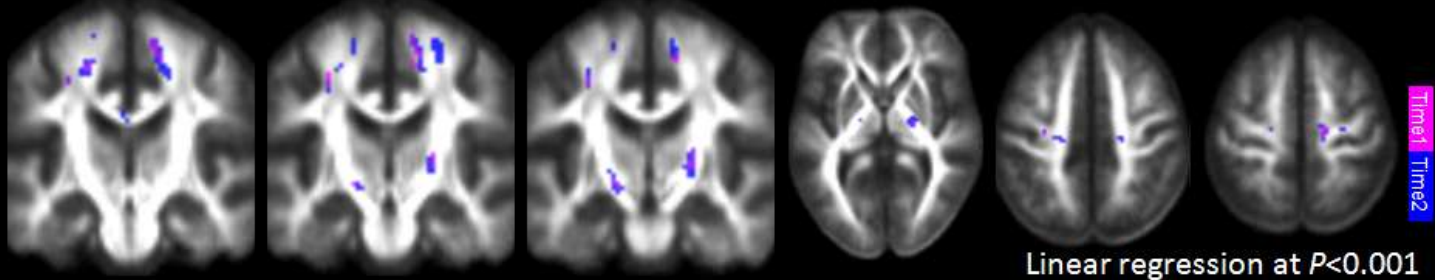- radial diffusivity dominates the pattern multivariate alterations.

(3) A diffusion tensor imaging study of longitudinal white matter degeneration in amyotrophic lateral sclerosis

➤ to test if DTI can capture the significant longitudinal changes in ALS patients (averagely 7mo followup scans).

➤ to test if the DTI alters differently over time in regard to ALS subgroups with different severities.

Group	ALS Subgroup	Number	Baseline Age	Sex	Exam Duration	Baseline ALSFRSR
Control		19	59.5 ± 8.8	10M:9F		
ALS		17	57.3 ± 10.0	10M:7F	8.0 ± 2.0 mo	34.6 ± 7.1
	Localized ALS	11	59.5 ± 8.8	6M:5F	7.7 ± 1.5 mo	36.5 ± 7.2
	Generalized ALS	5	51.4 ± 12.1	4M:1F	8.7 ± 3.1 mo	30.4 ± 4.4
	ALS / FTD	1	63	M	7 mo	44

(3) A diffusion tensor imaging study of longitudinal white matter degeneration in amyotrophic lateral sclerosis
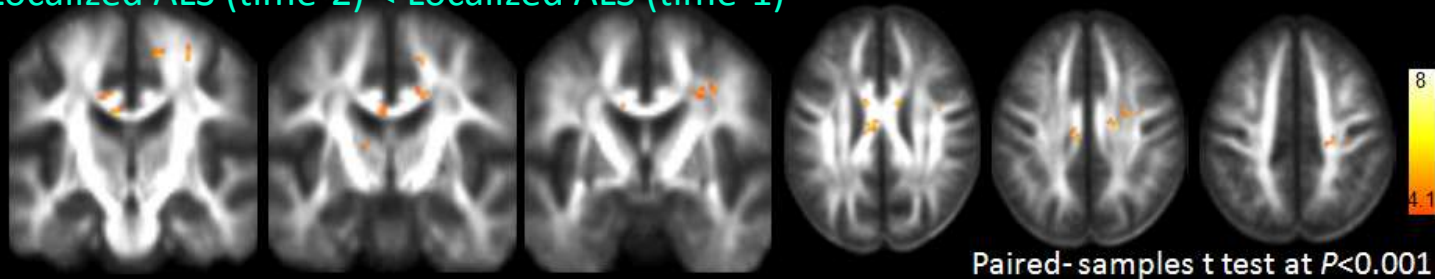

I. Overlay: ALS (time-1) < Control   ALS (time-2) < Control

Linear regression at *P*<0.001

II. All ALS (time-2) < All ALS (time-1)

Paired-samples t test at *P*<0.001
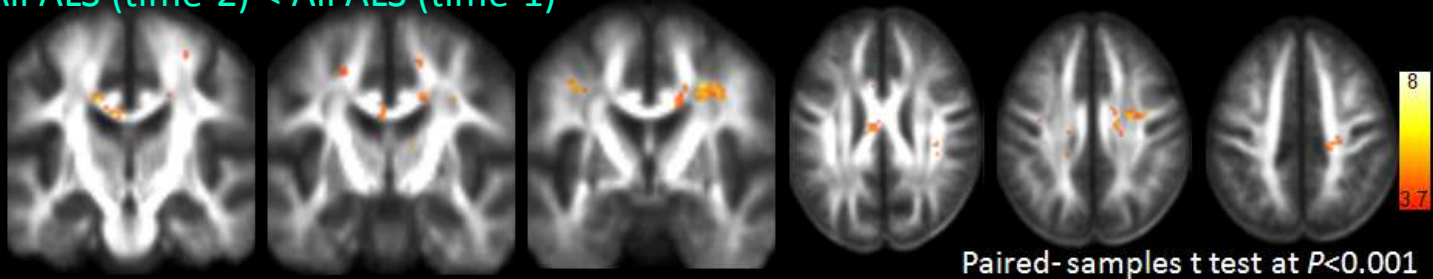
III. Localized ALS (time-2) < Localized ALS (time-1)

Paired-samples t test at *P*<0.001

(3) A diffusion tensor imaging study of longitudinal white matter degeneration in amyotrophic lateral sclerosis

Problems for submitting:

➤ Lack of a longitudinal control group (a group of PCD data can be used but the ages are quite older than ALS)

➤ No significant correlations between Δ FA and Δ ALSFRSR (severity) scores.

➤ follow-up durations are variant and not suitable for the paired-samples t test.

Abstracts and New findings

1) Co-analyses of GM Perfusion and Volume changes in AD and PD.

2) GM volume and WM FA Differences in pure FTD, FTD-ALS, and pure ALS

(1) Dissociated gray matter atrophy and hypoperfusion in Alzheimer's Disease and Parkinson's Disease

Regional patterns of significant GM volume loss (warm color) and hypoperfusion (cold color) in AD (*left,* n=22) and PD (*right,* n=26) when compare to CN (n=19).
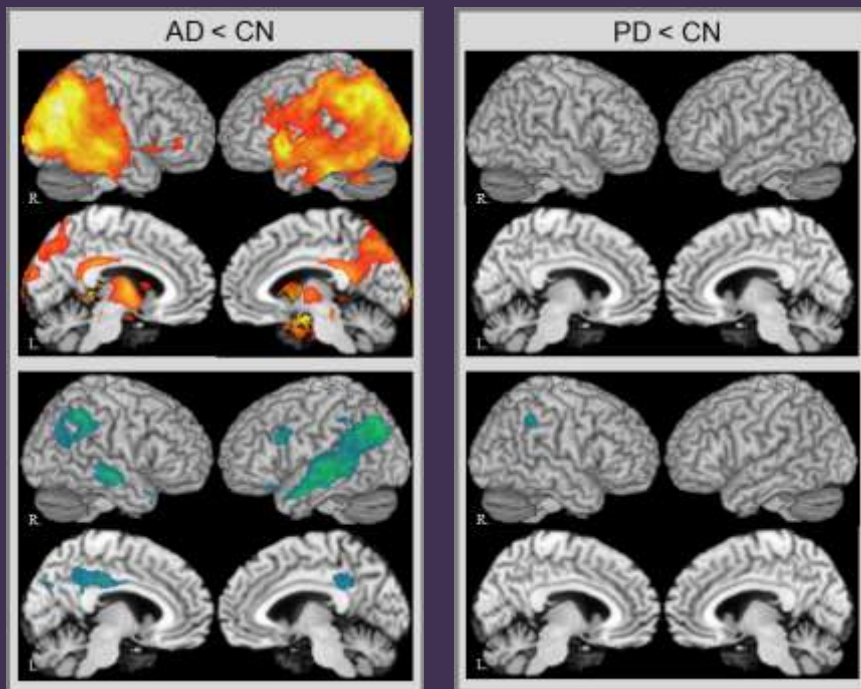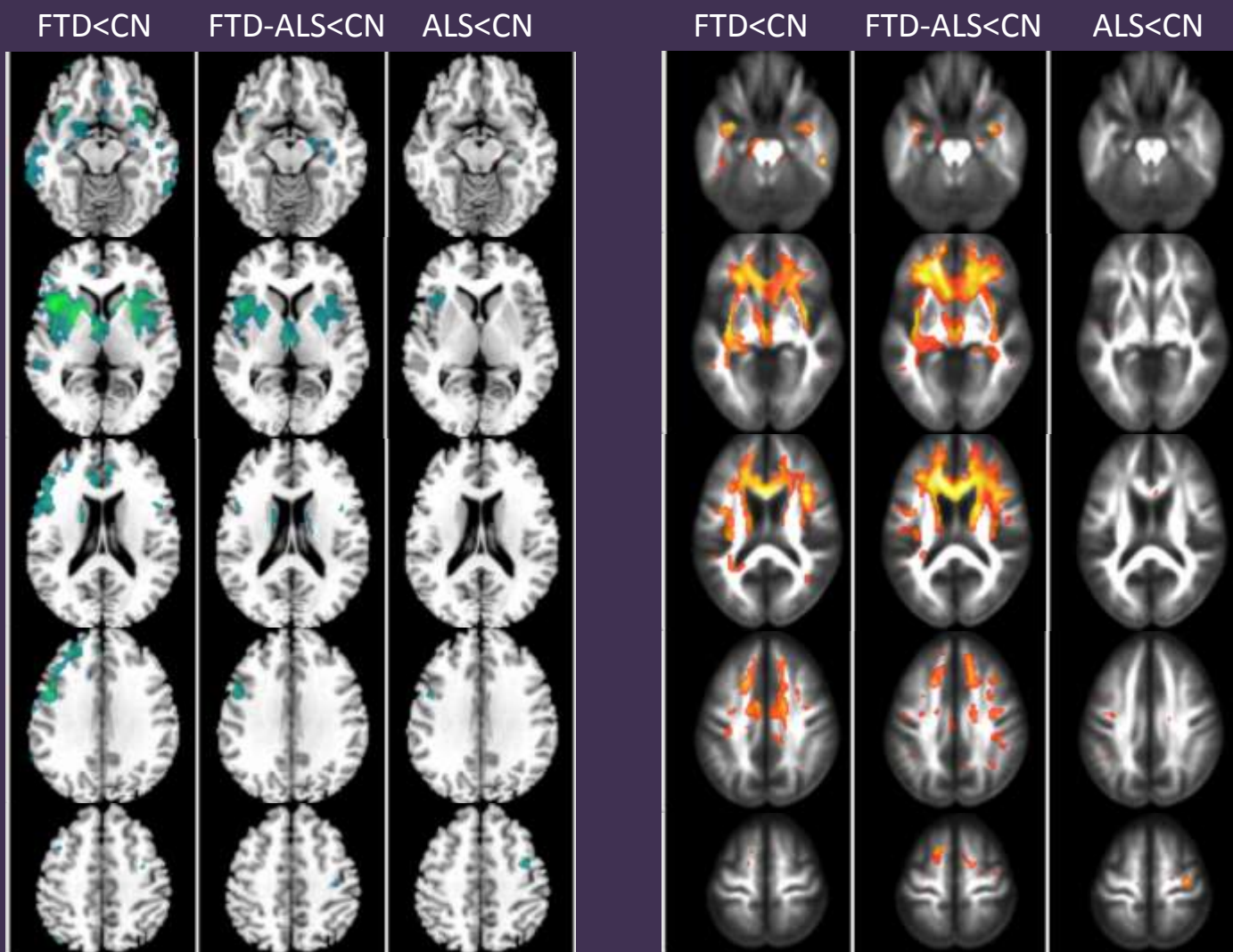
Regional patterns of significant GM loss dissociated with hypoperfusion in AD.

GM loss without hypoperfusion
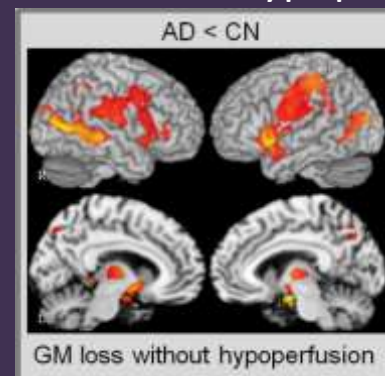
Regional patterns of significant GM hypoperfusion dissociated with volume loss in PD.

Hypoperfusion without GM loss
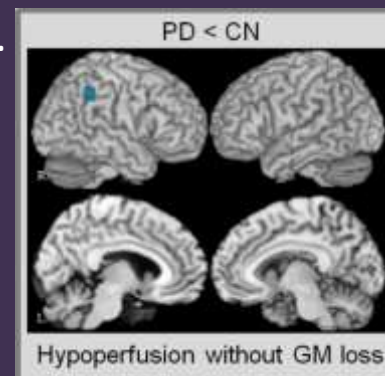
(2) Patterns GM/WM damages in FTD (n=12), FTD-ALS (n=8), and ALS (n=11) when compare to Controls (n=16)

(2) Patterns GM/WM changes in FTD, FTD-ALS, and ALS when compare to Controls

Reasons to rerun:

➢ Diagnosis has changed for some subjects. There are also some new data can be added.

➢ Both VBM and DTI can be reprocessed by DARTEL.
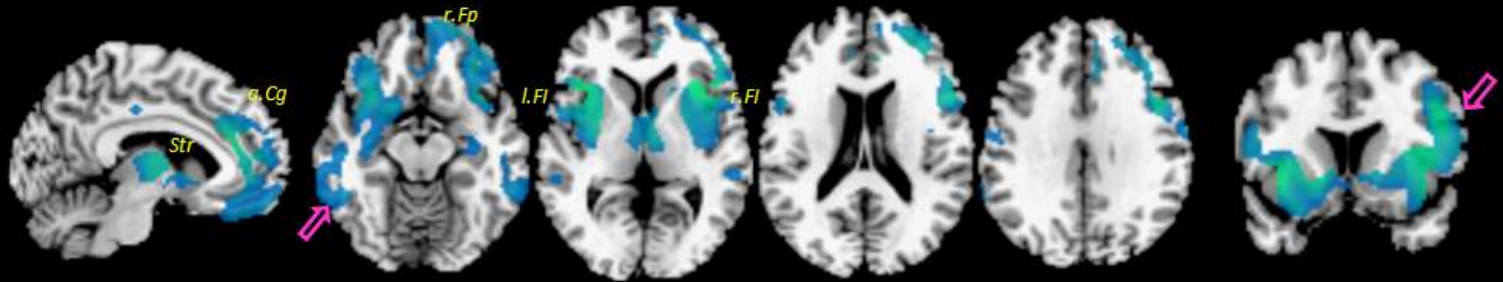
Tests for DARTEL

EMS Seg + DARTEL
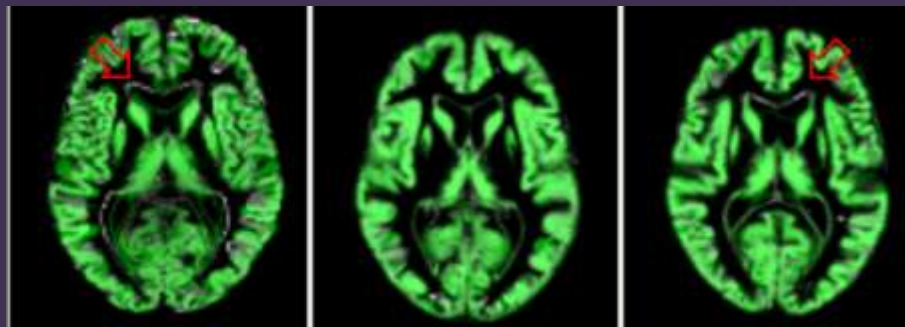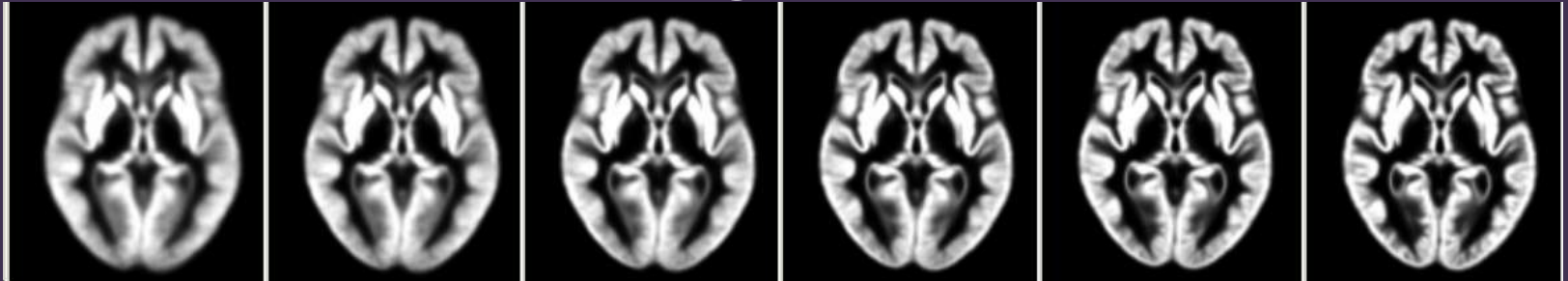
EMS Seg
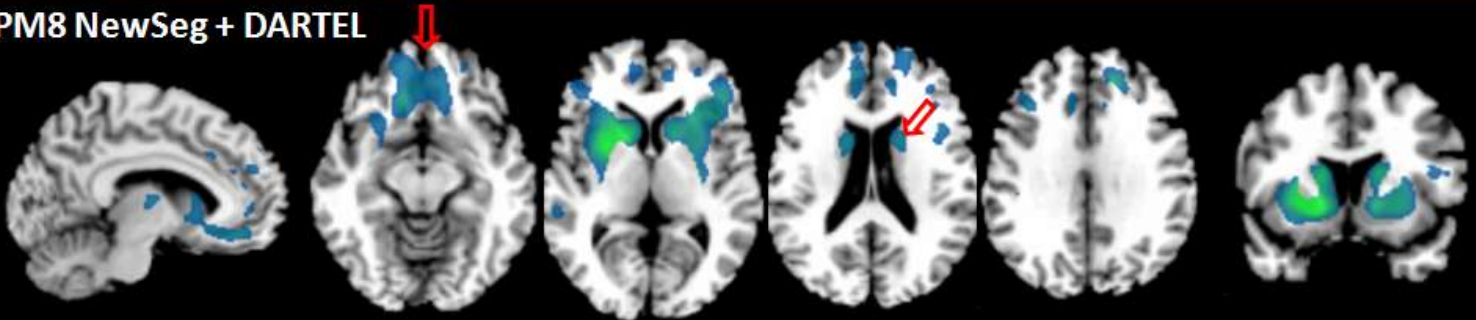+
SPM2 Spatial
Normalization

SPM8 NewSeg
+
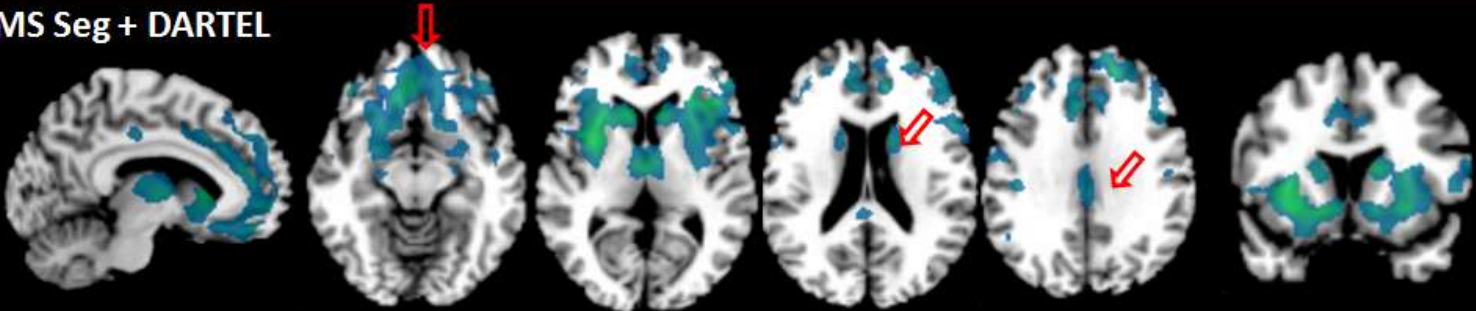SPM8 DARTEL

EMS Seg
+
SPM8 DARTEL

Patterns of bvFTD < CN

Does DARTEL also work for FA data?

DARTEL
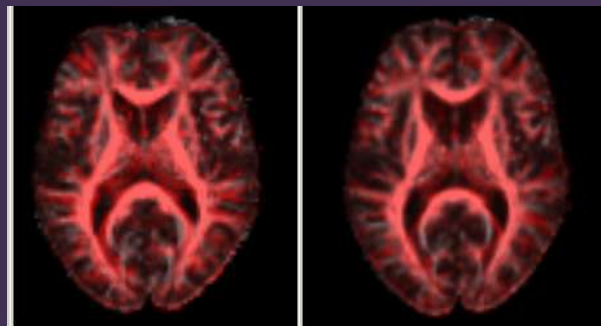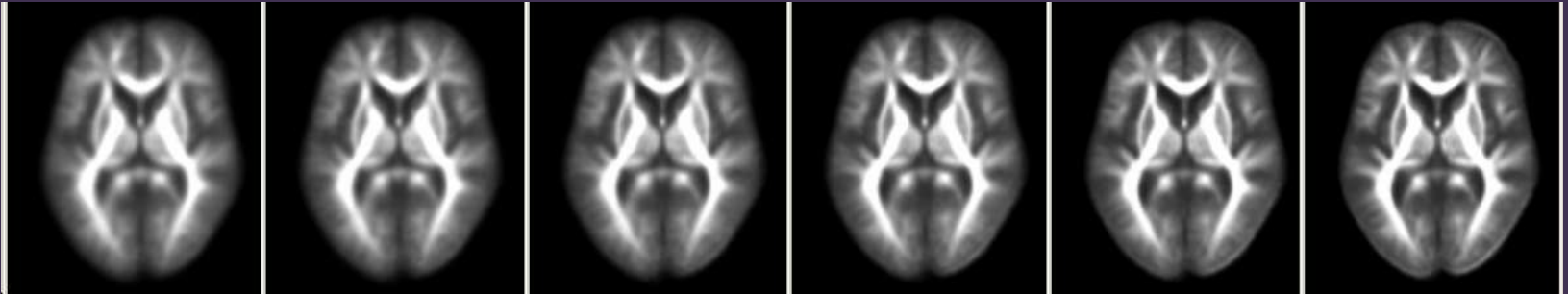
SPM8 Spatial Normalization

DARTEL

Patterns of bvFTD < CN